# Sarcouncil Journal of Education and Sociology

#### ISSN(Online): 2945-3542

Volume- 04 | Issue- 05 | 2025



**Research Article** 

Received: 10-04-2025 | Accepted: 23-04-2022 | Published: 19-05-2025

## Students' Problem-Solving Skills in Dyadic Alternative Approach

#### Jan Lester S. Montemor and Dr. Jenyliza T. Ucang

Science Education Department, Central Mindanao University, University Town, Musuan, Bukidnon, 8710 Philippines

**Abstract:** The study examined the effectiveness of dyadic alternative approach (DAA) in teaching Mathematics in Grade 11 HUMSS students of San Andres National High School (SANHS) for the School Year 2022-2023. Specifically, the study sought to: (1) ascertain the level of problem-solving skills of students in mathematics when exposed to DAA and non-DAA in terms of pretest and posttest (2) determine the significant difference in students' problem-solving skills in Mathematics when exposed to DAA and Non-DAA in terms of pretest and posttest. The study found out that students exposed to DAA have significantly higher level of problem-solving skills as to those exposed to non-DAA in terms of pretest and posttest. There is significant difference found in the students problem-solving skills in Mathematics exposed in both groups. **Keywords:** Problem-solving skills, Dyadic Alternative Approach.

### INTRODUCTION

Faculty, teachers, instructors, and professors are always concerned with providing appropriate educational preparations for students in the academic field. Asio & Riego de Dios (2019) showed what makes an educator well qualified, it is an essential aspect of educators to possess an innovative way to teach students.

One of the goals of Mathematics in the implementation of the K-12 Program is the problem solving. This is the focal point of mathematics learning, but there are still various issues and difficulties arising in teaching and learning Mathematics. The Philippines ranks last among participating nations in the Trends in International Mathematics and Science Study (TIMSS) 2019, conducted by the International Association for the Evaluation of Educational Achievement (IEA). Only 1% of Filipino students passed the high standard in Mathematics. This suggests that Filipino students lack problemsolving skills when it comes to tackling mathematical difficulties. Furthermore, at the national level, the National Achievement Test (NAT) 2019 results indicated that students had poor competence levels in Mathematics. This suggests that Mathematics Educators must cultivate the mathematical problem-solving skills of Filipino students.

Without a vast that majority of tertiary level students suffer in their performance in the university courses because they lack problemsolving ability in primary, secondary and higher secondary levels. These preparatory levels are the foundations of our students' success in the tertiary levels so educators must see to it that the problemsolving skills of the students are being improved in these stages. Different researchers have shown that majority of students nowadays have lack of problem-solving abilities. They do badly on basic logical reasoning exams. In fact, the research of Franestian, Suyanta and Wiyono (2020) said that the percentage result of problem-solving skill test and result of the interview on students about their obstacles in answering questions shows that students find difficulty because they forget the theory and they pay less attention to the important things in questions given so that their answers are not quite suitable. This result represents that students only focus on text since they only have been taught by memorizing technique and have not been trained to solve problems in the learning activity. Students only recognize problems and concepts but have difficulty to implement and evaluate relevant solutions.

The National Achievement Test results revealed that the Division of Bukidnon has a very low Mean Percentage Score (MPS), which is much below the 75% competence standard. This means that the majority of students in the Bukidnon division did not meet the competency level in Mathematics. This suggests that students lack mathematical comprehension and problem-solving ability. In connection to, the SHS Mathematics teachers of San Andres National High School (SANHS) are faced with the actuality of students having lack of problem-solving skills based on their written works, performance, assessment results. This shows that majority of the students do not attain the mastery level of understanding the subject. With this problem seen by the Mathematics teachers of San Andres National High School, this study is appropriate to be conducted in the locality.

Due to the aforementioned contexts, the researcher is looking for an alternative teaching approach that could perhaps address the problem. Students' problem-solving skills towards mathematics subject can be altered by improving the quality of instruction by using efficient approach and encouraging student participation in class. The researchers believes that the alternative approach they are looking for will improve students' problem-solving skills. This teaching approach is Dyadic Alternative.

The Dyadic Alternative is a creative educational approach that students work in pairs, communicate, and share ideas with one another. It is based on the idea that Licht (1993) proposed. In this approach, students will discuss and share with one another and work together to complete or perform a given task. Licht also suggested that "two heads are better than one" to which this study is being anchored upon.

The Dyadic Alternative encourages cooperation and active learning during discussion as well as a greater sense of ownership over their own learning. Additionally, it contributes to the development of a more social and less competitive environment that the students' value and enjoy. And it introduces students to a more practical teaching/learning model where cooperation is both necessary and crucial. At the very least, it provides students with a change of pace. It is a welcome change from the conventional lecture-based style of instruction. These are various responses to the topic of how someone learns all the mathematical methods and concepts over the course of several years.

In this research, Dyadic alternative pairs students who are performing well in mathematics with those who are struggling in a variety of classroom activities specifically focus problem-solving. Between the pre-test and post-test, which were taken individually a variety of exercises and quizzes will be completed with their pair. It is expected that through the process, those who are performing well will be able to influence those who are struggling and positively impact on their mathematics problem solving skills.

Students who took tests with a partner of their choice in a series of classroom studies reported that the experience increased their confidence, and their enjoyment of the course and subject matter (Zimbardo, Butler, and Wolfe, n.d.). Working on Math tasks in a group or with a pair will also enhance students' individual problem-solving skills (Jennie Pennant 2018). Students will be able to bounce their ideas around, acquire the idea of the partner and therefore, let the new idea emerge on how to solve the given problem.

From the research of Alcantara and Bacsa (2017) found that mathematics performance of the students is positively correlated to their level of problem-solving skills. With this, Dyadic Alternative Learning strategy has its advantage to gain positive results in students' problem-solving skills towards Mathematics. Hence, it gives the researcher an idea to conduct a study on the use of the dyadic alternative to improve students' problem-solving skills.

### METHODOLOGY

The research design employed in this study is a quasi-experimental design. The levels problemsolving skills was analyzed using descriptive statistics such as mean, standard deviation, frequency and percentage. The analysis of covariance (ANCOVA) was the statistical tool use to analyzed the significant difference of the students' problem-solving skills in mathematics between DAA and Non-DAA using the pretest as the covariate.

This was conducted at San Andres National High School – San Andres, Kadingilan, Bukidnon. Intact class was used to determine the DAA and non-DAA group. Section 11-HUMSS A was taught as the Non-DAA group which consisted of 30 students and section 11-HUMSS B was taught using the DAA group which consisted of 30 students also which sum up to 60 participants. The Grade 11 SHS students of San Andres National High School are heterogeneous by group.

The research instruments that were used in the study were the pretest and posttest to measure the level of problem-solving skills of the students. The seven (7) items included in the test was based on Grade 11 Module in the Second Semester. The draft of the problem-solving test was presented to 3 experienced mathematics teachers for face validation.

After the item validation, the final draft of the test was administered to the subjects of the study. The responses were scored using the level of problemsolving skill rubric based on Kentucky Holistic Scoring Rubric for Grade 12 Math. To measure the problem-solving skills of students exposed to dyadic alternative approach the following scale was used during the interpretation adapted and modified from the K to 12 curriculums:

Table I: Problem-Solving Skills Assessment Scale					
<b>Range of Score</b>	Level of Problem-Solving skills				
29-35	Superior				
22-28	Above Average				
15-21	Average				
8-14	Below Average				
0-7	Poor				

# **RESULTS AND DISCUSSION**

**Level of Problem-Solving Skills.** Table 2 and 3 shows the level of the student's problem-solving skills in Dyadic Alternative Approach (DAA) and Non-Dyadic Alternative Approach (Non-DAA) on

the pretest and posttest. It shows the range of scores, descriptive rating, frequency distribution, percentage, and the qualitative interpretation of the collected data.

 Table 2: Level of Problem-Solving Skills of Students exposed to Non-Dyadic Alternative Approach on the pre- test and posttest

Range of Score	Non-DAA							
	Pretest		Posttest					
	f	%	f	%	Level of Problem-Solving Skills			
29-35	0	0	3	10	Superior			
22-28	0	0	15	50	Above Average			
15-21	3	10	9	30	Average			
8-14	18	60	3	10	Below Average			
0-7	9	30	0	0	Poor			
Mean= 9.90				90	Mean= 21.07			
SD= 2.721					SD= 5.324			

**Table 3:** Level of Problem-Solving Skills of Students exposed to Dyadic Alternative Approach on the pretest and posttest.

Range of Score	DAA				
	Pretest		Posttest		
	f	%	f	%	Level of Problem-Solving Skills
29-35	0	0	7	23.33	Superior
22-28	0	0	13	43.33	Above Average
15-21	4	13.	10	33.33	Average
		33			
8-14	20	66.	0	0	Below Average
		67			
0-7	6	20	0	0	Poor
Mean= 9.88					Mean= 22.70
	SD= 2.694			94	SD= 5.664

The results presented in Tables 2 and 3 indicate that students exposed to the Dyadic Alternative Approach (DAA) demonstrated significantly greater improvement in their problem-solving skills compared to those in the Non-Dyadic Alternative Approach (Non-DAA). In the pretest, both groups primarily fell within the "poor" and "below average" performance categories. However, the posttest results showed a clear upward shift in the DAA group, with 23.33% of students reaching the "superior" level and 43.33% achieving "above average," while no students remained in the "poor" or "below average" categories. These findings are consistent with existing research that highlights the benefits of dyadic and collaborative learning environments in developing higher-order thinking and problem-solving competencies.

Copyright © 2022 The Author(s): This work is licensed under a Creative Commons Attribution- NonCommercial-NoDerivatives 4.0 (CC BY-NC-ND 4.0) International License

Analysis of Covariance (ANCOVA) of Posttest Results in Problem Solving Skills Between Interventions. Table 4 shows the Analysis of Covariance (ANCOVA) of the Problem-solving skills of students exposed between groups. The pretest was used as covariate to statistically equate dissimilar prognostic values which may affect the analysis. The mean scores differ significantly in the group performance with F-value equal to 13.017 (p<0.05) which indicate significant difference; thus, the null hypothesis stating that there is no significant difference in the level of problem-solving skills of students between the groups is rejected.

<b>Table 4:</b> Difference in mathema	tics performance of student	is exposed to DAA and	Non-DAA in terms of					
posttast								

positest.									
	Group		Μ	lean	Std. Deviation		1		
	Non-DAA	30	21	21.07 5.32		4			
	DAA	30	22.70 5		5.664				
	Total	60	21	.88	5.51	1			
Source SS		S	df	N	IS	<b>F-value</b>	Sig.		
Group 42.549			1	42.549		3.220	0.001		
PRETEST 998.947			1	998.947		75.596	0.00		
(Covariate)									
Error	753.21	9	57						
Total	30525.0	00	60						

\*\* *p* < 0.05

The results of the study support the growing body of literature demonstrating the effectiveness of dyadic or paired learning approaches in enhancing problem-solving skills. Webb et al. (2017) emphasized that dyadic interactions enhance students' learning by encouraging them to explain their reasoning, listen to peer feedback, and refine their understanding through meaningful dialogue. These cognitive and social processes help learners progress from surface-level understanding to deeper conceptual mastery. The effectiveness of dyadic problem-solving has also been demonstrated by Gok (2015), whose study showed that students working in pairs outperformed those in traditional instruction in terms of problemsolving accuracy and retention of concepts. This supports the improved mean performance of the DAA group (from 9.88 to 22.70), compared to the more modest gains in the Non-DAA group.

Similarly, Laal and Ghodsi (2016) found that structured peer interactions within dyads promote motivation, critical thinking, and persistence-key attributes needed for success in mathematical problem-solving. Their findings explain the complete elimination of "poor" and "below average" students in the DAA group by the posttest, as these peer interactions likely fostered accountability and sustained engagement. Moreover, Toraldo, Di Gennaro, and Regolini (2020) reported that dyadic pairings, especially when involving students of differing skill levels, benefit all participants. Higher-achieving students consolidate their knowledge by explaining concepts, while lower-achieving students gain from immediate feedback and modeling of effective strategies.

Finally, Kim and Hannafin (2022) underscored the importance of structured dyadic learning, where designated roles (e.g., explainer and questioner) enhance metacognitive awareness and collaborative problem-solving. These structured interactions not only lead to improved academic outcomes but also help students develop confidence in navigating complex tasks-an outcome reflected in the performance of the DAA group. In contrast, the Non-DAA group, while showing some improvement, retained a higher percentage of students in the "average" and "below average" categories, suggesting that unstructured or independent learning may be less effective in raising all students to higher performance levels.

These empirical findings affirm the effectiveness of the Dyadic Alternative Approach in fostering significant improvements in students' problemsolving skills through collaborative, reflective, and socially supported learning structures.

### CONCLUSIONS RECOMMENDATIONS

AND

Students in Non-DAA and DAA groups both did not meet the superior and above average level in problem solving skills in Mathematics in the pretest. After the posttest, both groups had a superior and average level in problem solving skills but there were more students who belong to superior level in the DAA group compared to Non-DAA group. Moreover, there were no students belong to below average and poor in the DAA compared to Non-DAA. Thus, the Dyadic Alternative Approach (DAA) helped the students improve their problem-solving skills and even made it into the higher levels.

A significant difference of the level of problemsolving skills in mathematics before and after the treatment implies that the instructional strategy affected the students' level of problem-solving skills by significantly improving their posttest scores. Dyadic Alternative Approach made the students perform better than those in the Non-Dyadic Alternative Approach.

Administrators are enjoined to revisit the curriculum and may recommend infusing the use of dyadic alternative approach (DAA) in a classroom setting and encouraging teachers not to limit their assessment on individual testing. Mathematics teachers are encouraged to use dyad alternative approach (DAA) in their instruction because this was found to be a better teaching method in improving students' problem-solving skills.

### **REFERENCES**

- 1. Aguanta, E. R. J. R. & Tan, D. A. "Effects of dyad cooperative learning strategy on students' academic performance and attitude towards mathematics." *International Journal of English and Education*, 7.3 (2018).
- Alcantara, E. C. & Bacsa, J. M. P. "Critical thinking and problem-solving skills in mathematics of Grade-7 public secondary students." Asia Pacific Journal of Multidisciplinary Research, 5.4 (2017).
- Asio, J. M. R. & Riego de Dios, E. E. "The college students' perspective on what makes an educator well-qualified." *Journal of Pedagogical Research*, 3.3 (2019): 126–138.
- Franestian, I. D., Suyanta, & Wiyono, A. "Analysis of problem-solving skills of students in junior high school." *Journal of Physics: Conference Series*, 1440.1 (2020): 012093.
- 5. Gok, T. "The impact of peer instruction on college students' beliefs about physics and conceptual understanding of electricity and magnetism." *International Journal of Science and Mathematics Education*, 13.3 (2015): 469–491.
- 6. Hartl, A. C., DeLay, D., Laursen, B., Denner, J., Werner, L., Campe, S. & Ortiz, E. "Dyadic

instruction for middle school students: Liking promotes learning." *Unpublished manuscript* (2015). Retrieved from <u>https://www.researchgate.net/publication/2838</u> 53558

- Kim, C. & Hannafin, M. J. "Scaffolding problem-solving in technology-enhanced learning environments (TELEs): Bridging research and practice." *Educational Technology Research and Development*, 70.2 (2022): 601–625.
- Laal, M. & Ghodsi, S. M. "Benefits of collaborative learning." *Procedia - Social and Behavioral Sciences*, 31.1 (2016): 486–490.
- Licht, N. C. "The dyadic alternative: Organizing students into cooperative pairs." *In*: J. Chambers (Ed.), *Selected Papers from the Fourth National Conference on College Teaching and Learning*. Florida Community College, Ocala, FL (1993): 121–129.
- 10. Lizano, M. S. "Students' mathematics performance with quiz buddy in a cooperative learning environment." *Unpublished Master's Thesis*, Central Mindanao University, Musuan, Bukidnon (2015).
- Polya, G. "On solving mathematical problems in high school." *In S. Krulik (Ed.), Problem Solving in School Mathematics* (1980): 1–2. Reston, Virginia: NCTM.
- 12. Rahman, M. M. "21st century skill 'problem solving': Defining the concept." *Asian Journal of Interdisciplinary Research*, 2.1 (2019): 71–81.
- 13. Savage, J. M. "Use of the Dyadic Alternative to make learning more active, collaborative, and fun." *Natural Resources and Environmental Issues*, 7.1 (1998): Article 70.
- Toraldo, A., Di Gennaro, L. & Regolini, A. "Peer tutoring and cooperative learning: A new model of learning for university students." *Journal of Educational Research and Practice*, 10.1 (2020): 233–246.
- Webb, N. M., Franke, M. L., Ing, M., Chan, A. G., Freund, D., Shein, P. P. & Battey, D. "Engaging with others' mathematical ideas: Interrelationships among student participation, teachers' instructional practices, and learning." *International Journal of Educational Research*, 86.1 (2017): 78–93.
- Zimbardo, P. G., Butler, L. D. & Wolfe, V. A. "Cooperative college examinations: More gain, less pain when students share information and grades." *The Journal of Experimental Education*, 71.2 (n.d.): 101–125.

Copyright © 2022 The Author(s): This work is licensed under a Creative Commons Attribution- NonCommercial-NoDerivatives 4.0 (CC BY-NC-ND 4.0) International License

#### Source of support: Nil; Conflict of interest: Nil.

Cite this article as:

Montemor, J.L.S. & Ucang, J.T. "Students' Problem-Solving Skills in Dyadic Alternative Approach." *Sarcouncil Journal of Education and Sociology* 4.5 (2025): pp 1-6.